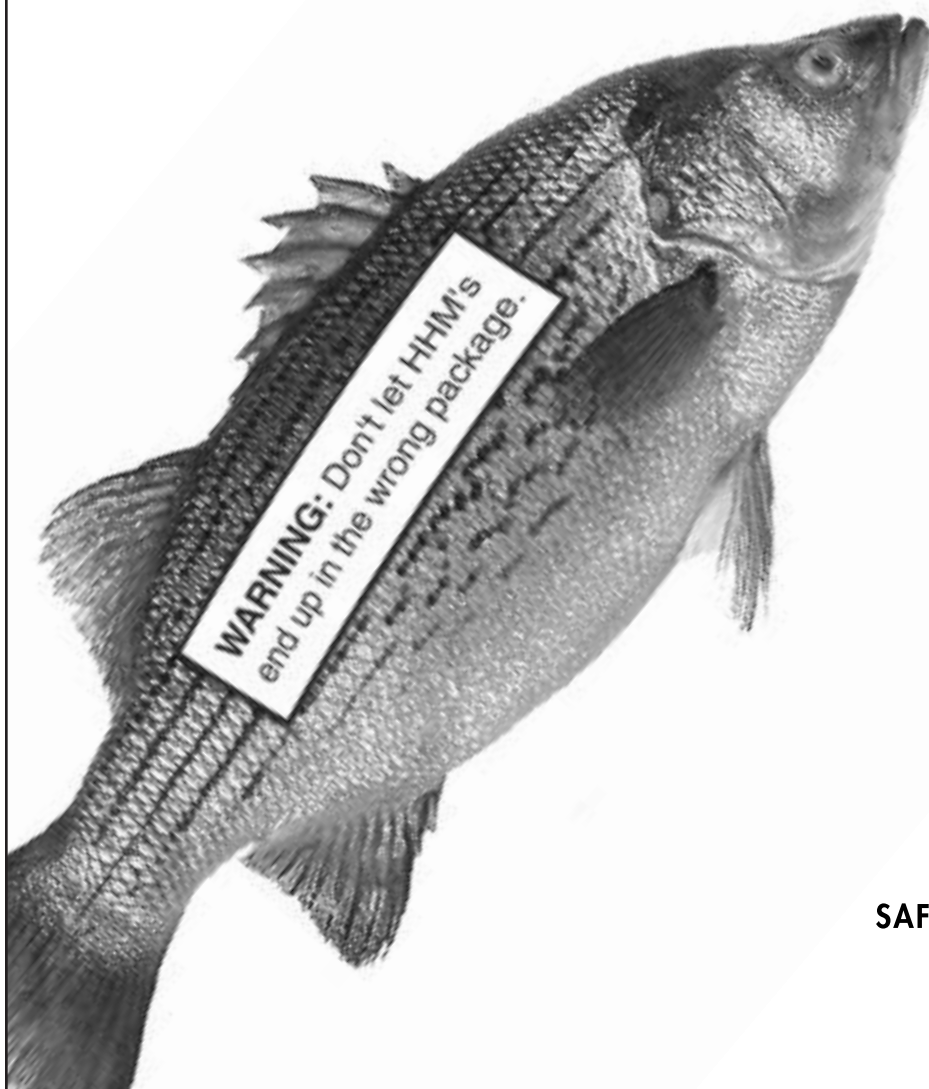


GRADES 4-7

HOUSEHOLD **HAZARDOUS** MATERIALS EDUCATION SUPPORT PROGRAM



**SAFE, SMART,
SOLUTIONS FOR IOWA**

PURPOSE

This is designed to teach students about the presence of household hazardous materials, along with alternative products and proper procedures for storing, recycling, and disposing of the materials. The ultimate goal is to help create an educated population that will lead an effort toward cleaner, safer, less-contaminated surface water and groundwater, Iowa's drinking water sources. While the executable time frame can be customized to the grade level and depth of student involvement the instructor wishes to explore, the program is designed to be a 5-10 class period project.

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I. Classroom Introduction

- A. EPA: Americans generate 1.6 million tons of household hazardous materials per year.
- B. The average home can accumulate about 100 pounds of HHMs.
- C. According to the Iowa Poison Control Center, HHMs are the leading cause of accidental poisonings among children.
- D. Improper use/disposal can put HHMs right into our surface waters and the groundwater supply.
- E. The majority of Iowa's drinking water supply comes from groundwater.

II. Classroom Session #1 – Identifying Household Hazardous Materials

A. What Makes Products Hazardous?

- 1. Flammable/Combustible: Easily set on fire
- 2. Explosive/Reactive: Reacts violently when exposed to heat, sudden shock, pressure, or other chemicals.
- 3. Corrosive: Chemical action can burn and destroy living tissue or metal on contact.
- 4. Toxic: Capable of causing injury or death through ingestion, inhalation, or absorption through the skin.

B. Signal Words

- 1. Danger: Extremely flammable, corrosive, or highly toxic.
- 2. Poison: Highly toxic.
- 3. Caution: Mild to moderate hazard.
- 4. Warning: Moderate hazard.
- 5. "Non-toxic" and "biodegradable" lack regulatory definitions and are used for advertising purposes.

C. Hazardous Materials Around the House

- 1. Paints and Solvents
 - a. Paint –Oil-based (Toxic/Flammable)
 - b. Paint Thinner (Toxic/Flammable)
 - c. Rust remover/turpentine/furniture stripper (Flammable)



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2. Cleaners
 - a. Drain Openers/Kitchen-Bathroom Cleaners/Bleach (Corrosive/Toxic)
 - b. Furniture Polish; Spot Removers (Toxic/Flammable)
3. Automotive/Engine Products
 - a. Used Motor Oil/Oil Filters (Toxic)
 - b. Old Gasoline (Toxic/Flammable/Explosive)
 - c. Antifreeze (Toxic)
 - d. Car Batteries (Corrosive)
 - e. Car Wax/Detergents (Toxic)
 - f. Other Fluids (Windshield Wiper fluid; Brake Fluid; Transmission Fluid) (Toxic)
4. Pesticides/Herbicides
 - a. Weed Killer; Insecticides; Flea-Roach Powder; Rat/mouse Poison; Mothball (Poisonous); Flea Collars (Toxic)
 - b. Wood Preservatives (Toxic/Flammable)
5. Miscellaneous
 - a. Shoe Polish (Toxic)
 - b. Pool Chemicals (Toxic)
 - c. Arts & Crafts Materials (Toxic)
 - d. Nail Polish Remover (Toxic/Flammable)

D. Exercises

1. Home Survey

Objective – To show students that Household Hazardous Materials are real products that every one of them has in their homes.

Materials – Take-home Household Hazardous Materials checklist (included in this packet).

Procedure – Distribute a checklist of common household hazardous materials (attached) and have students, preferably with their parents, check their homes to see how many can be found. Can they find others not included on the list? (Remind students not to touch the materials.)

2. Product Label Worksheet (IDNR)

Objective – A “real life” lesson that products in the students’ own homes contain harmful materials that must be responsibly handled.

Materials – A variety of products containing Household Hazardous Materials, either brought by the teacher for classroom use, or that the students have in their homes. If the teacher conducts this in the classroom, it should be a demonstration only, and not permitting the students to handle the products. Be sure to include a wide variety – pesticides, cleaners, solvents, etc.

Procedure – If done in the students’ homes, have students (with parental supervision!) read the warning labels found on product containers and make a list of the key words found on the warning labels. If done in the class, the instructor should read the labels to the class, and have each class member write down words they hear that would indicate the product is dangerous.

Divide into small groups and discuss key words found on the label that warn of the products’ danger? Have each group present the findings of their product to the class, along with their evaluation of how effective the label is and how it could be improved.

HHM SESSION ONE QUIZ

Name: _____

IDENTIFYING HOUSEHOLD HAZARDOUS MATERIALS

1. Name the four primary categories of Hazardous Household Material.

2. Name three words of warning you'll likely find on the label on an HHM product.

3. Latex paint is not hazardous to the environment.

☐ True ☐ False

4. "Biodegradable" on a product label means it's not hazardous.

☐ True ☐ False

5. List three products used by cars that are Household Hazardous Materials.

6. What are the three ways something that's toxic can cause injury or death?

7. A chemical is officially considered corrosive if it can burn and destroy

_____ or _____ .

8. Flea collars are dangerous to more than fleas.

☐ True ☐ False

9. Virtually every home has Household Hazardous Materials stored in it.

☐ True ☐ False

10. If a chemical has been shown to cause cancer, it's considered a Household Hazardous Material.

☐ True ☐ False

IDENTIFYING HOUSEHOLD HAZARDOUS MATERIALS

1. Name the four primary categories of Hazardous Household Material.

Flammable (or Combustible)

Explosive (or Reactive)

Toxic

Corrosive

2. Name three words of warning you'll likely find on the label on an HHM product.

Could be: Danger, Poison(ous), Warning, Explosive, Flammable, Corrosive, or Caution

3. Latex paint is not hazardous to the environment.

☒ True ☐ False

*Only oil-based paints are considered hazardous to the environment (although latex paint does include chemicals hazardous to your health, they're not especially dangerous to the environment.)
Latex paint can be safely discarded in the garbage if dry.*

4. "Biodegradable" on a product label means it's not hazardous.

☐ True ☒ False

Biodegradable not only is not a government-sanctioned term, it has nothing directly to do with a product's danger to health.

5. List three products used by cars that are Household Hazardous Materials.

Could be: Oil, gas, antifreeze, transmission fluid, brake fluid, car wax, windshield wiper fluid, car detergent etc.

6. What are the three ways something that's toxic can cause injury or death?

Breathe it in

Absorb it through the skin

Swallow it

7. A chemical is officially considered corrosive if it can burn and destroy

Skin

or

Metal .

8. Flea collars are dangerous to more than fleas.

☒ True ☐ False

They are considered a Household Hazardous Material.

9. Virtually every home has Household Hazardous Materials stored in it.

☒ True ☐ False

10. If a chemical has been shown to cause cancer, it's considered a Household Hazardous Material.

☒ True ☐ False

It's considered a "toxic" HHM.

HOUSEHOLD HAZARDOUS MATERIALS WORKSHEET

Name: _____

HOW MANY CAN YOU FIND IN YOUR HOUSE?

Directions: Parents, please review this list with your child, crossing off each HHM stored inside your home. Talk to your child about how you store these materials and how they are safely stored.

CAR PRODUCTS

Antifreeze
Batteries (lead acid)
Brake Fluid
Carburetor Cleaner
Car Wax
Engine Degreaser
Gasoline
Motor Oil
Transmission Fluid
Windshield Wiper Fluid

YARD SUPPLIES

Fertilizer
Insecticide
Weed Killer

HOUSEHOLD SUPPLIES

Aerosols
Air Freshener
Glue
Hair Color
Hair Spray
Nail Polish
Nail Polish Remover

CLEANERS

All-Purpose Cleaner
Ammonia
Bathroom Cleaner
Bleach
Carpet Cleaner
Disinfectant
Drain Cleaner
Floor Cleaner
Furniture Polish
Metal Polishes
Oven Cleaner
Paint Thinner
Scouring Powder
Spot Remover
Window/Glass Cleaner

MISCELLANEOUS

Asphalt/Roofing Tar
Batteries (NiCad-Rechargeable)
Batteries (DryCell – button)
Flea Sprays/Collars
Kerosene
Lighter Fluid
Mothballs
Paint (oil-based)
Photography Chemicals
Pool Chemicals
Rodent Killer

Others?

III. Classroom Session #2 - How Household Hazardous Materials Contaminate Groundwater

A. A Study of Groundwater

1. According to the DNR, 78.8% of Iowans get their drinking water from groundwater.
2. According to the U.S. Geological Survey, as of 1990 only six states relied more on groundwater as a drinking water source:
 - a. Hawaii – 97.1%
 - b. Mississippi - 90.2%
 - c. Florida – 89.2%
 - d. New Mexico – 87.0%
 - e. Idaho - 81.4%
 - f. Nebraska – 81.2
3. Nationwide, 41.9% of the population gets its drinking water from ground water — about 15 billion gallons a day!
4. Where does your community get its drinking water? See the IDNR Web site: www.safesmartolutions.org
5. Nationally, groundwater supplies 75% of water used for livestock, irrigation, and commercial purposes.
6. Groundwater feeds lakes and streams, affecting their ecosystems.
7. In the United States, the volume of groundwater within 2,500 feet of the surface has been estimated at 100 quadrillion gallons (16 times the volume of the Great Lakes). At least half is too salty from natural causes to be used for drinking water.
8. In general, HHMs are rarely going to directly contaminate groundwater.
 - a. Most often, they contaminate surface water and over time reach groundwater.
 - b. The exceptions are drainage wells, liquid leakage from landfills (leachate), and topography with deep crevices.



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9. Deeper aquifers have a higher rate of natural contamination from dissolved mineral content and radioactive materials. Shallow aquifers are more susceptible to man-made contamination.

10. Types of aquifers

- a. Alluvial Aquifers – These are sand gravel deposits soaked with water usually not far underground. These supply the largest quantity and best natural quality water.
- b. Buried Channel Aquifers – These are deeper sand and gravel deposits associated with ancient streams. These do exist at numerous locations in Iowa.
- c. Bedrock Aquifers – These are made of bedrock, especially sandstone and fractured limestone. They can be shallow or deep (in the southwestern part of Iowa, they're 2,000 feet underground).
- d. Glacial Drift Aquifers – These aquifers, which are located across most of the state, were created by glaciers and consist of silty clay materials with occasional pockets of sand and gravel.

B. A Study of Surface Water

1. In Iowa, surface water consists of:
 - a. Lakes
 - b. Ponds
 - c. Rivers
 - d. Creeks
 - e. Streams
 - f. Wetlands (areas where water covers the soil or is present at or near the surface). Most commonly found in:
 - i. Riperian Wetlands (on floodplains alongside rivers & streams).
 - ii. Isolated depressions surrounded by dry land.
2. HHMs are usually carried by rain into surface water (through run-off and storm sewers), and over time reach groundwater.
3. HHM contamination affects more than just drinking water quality.

It can also:

 - a. Be absorbed by fish, and then when eaten reach “the wrong package.”
 - b. Be ingested or absorbed by people when swimming.

C. Which Household Hazardous Materials discussed in Session #1 are most likely to reach Iowa waters and end up in the “wrong package”?

1. Fluids (oil, antifreeze, pesticides, detergents, paint, etc.)
2. Fertilizer (applied directly to ground and flushed by rain)

D. How do HHMs reach Iowa's waters?

1. Point Sources (localized in an acre or less)
 - a. Feed lots
 - b. Industrial sites
 - c. Landfills
 - d. Storm sewers (when defined by outflow)
2. Nonpoint Sources (Sources dispersed over broad area)
 - a. EPA Definition: "NPS pollution is caused by rainfall or snowmelt, moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water."
 - b. The EPA says NPS pollution "is the main reason that 40% of (the nation's) assessed water bodies are unsafe for basic uses such as fishing or swimming."
 - c. Sources include:
 - i. Household drains
 - ii. Farm fields
 - iii. Storm sewers (when defined by inflow collection points)
 - iv. General ground contamination

E. Suggested Illustration/Demonstration: Ask City Engineering representative to attend class or provide materials to explain where the local drinking water supply originates, as well as how the sewage treatment and storm sewer systems operate. Look for specifics, such as where the storm sewers empty. Some communities do process storm sewer drainage (making them vulnerable to water flow that exceed treatment capacity during heavy storms, and causing raw sewage to be released into the waterway). Most do not, with their storm sewer systems merely channeling water back into the environment without treatment, contaminating rivers, streams, and lakes.

F. Discussion: What happens...

- a. to hazardous materials that are poured down the drain?
- b. to hazardous materials poured on the ground?
- c. to hazardous materials poured in the storm sewer?



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G. Exercises

1. Waterflow Demonstration

Objective – Students will gain an awareness of how water supplies can be contaminated through neighborhood runoffs.

Materials – Water; wax paper; tape; food coloring; salt; oil; clay; pepper; sugar; “other pollutants;” eyedropper.

Procedure – Using small groups of 3-5 students, cover cardboard piece with wax paper and use the clay to form a maze with one starting point and two exit points (one labeled “treatment plant” and one “stream.”) Let the clay dry for one day. Have students list things that can enter a street gutter inadvertently or on purpose and can be carried by the water flow. Place drops of food coloring and salt water mixed with pepper, and oil on different locations within the maze.

Allow one day for the water to evaporate, then tilt the maze and add a drop of water at the starting point, letting it drop slowly to an exit. Examine the contaminants it collects along the way. Drops that exit to the “treatment plant” are replaced with a fresh drop. Drops that return to the water supply untreated should be collected in a glass jar to examine the pollutants.

2. Aquifer Sundae (www.groundwater.org)

Objective – To demonstrate for students about geological formations in an aquifer and how contaminants can enter the water system and filter down into the water table.

Materials – Blue or red food coloring; vanilla ice cream; clear soda pop; crushed ice; variety of colored sprinkles and sugars; drinking straws; clear plastic cups.

Procedure – Have the instructor demonstrate by filling a clear plastic cup 1/3 full with crushed ice (representing underground gravel and soil). To represent the water in the aquifer, add just enough soda to cover the ice. Add a layer of ice cream to serve as the geologic “confining layer” that lies above the aquifer. Then add more crushed ice to represent upper soil. Cover top with colored sugars and sprinkles to represent top soil, creating a porous surface.

Add food coloring to the soda and pour it on top of the “aquifer.” Observe what happens when the “contamination” is added to the environment. Then using a straw, “drill” a well by sucking on the straw — watch how the water table lowers and how contamination gets sucked into the well area and ultimately reaches the groundwater. Recharge the aquifer by adding more rainfall (soda).

While the aquifer can then be eaten, care should be taken to avoid the message that “contaminated water” can be safely consumed. It’s recommended that only the teacher do the activity as a demonstration, making a point of discarding the “contaminated” and spoiled aquifer. The students may then be encouraged to share the leftover ingredients.

3. Storm Sewer Stencils

The class can be encouraged to join other organizations around the country volunteering to paint signs at entry points to storm sewers that empty direction into surface water. They use stencils that show the image of a fish and the words, “Dump No Waste. Drains To Stream.” For further information on Storm Sewer Stencils log on to www.earthwater-stencils.com. or

www.ciwmb.ca.gov/UsedOil/Grants/Resources/Vendors/Stencils.doc.

Be sure to first secure permission from community officials!



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HHM SESSION TWO QUIZ

Name: _____

HOW HOUSEHOLD HAZARDOUS MATERIALS CONTAMINATE GROUNDWATER

1. Why is Iowa more reliant on groundwater as a source for drinking water than almost all other states?
2. Why might Hawaii and Florida be even more dependent on groundwater than Iowa?
3. In general, will HHMs affect groundwater or surface water first? Why?
4. An Aquifer is:
 - a. a giant underground hollow area filled with water.
 - b. an underground saltwater ocean.
 - c. places underground where water has saturated the rock or gravel.
 - d. a large surface lake.
5. Pollution can't reach the underground aquifers.
☐ True ☐ False
6. Buried Channel aquifers generally have the best-quality water because they're more protected from man-made contamination.
☐ True ☐ False
7. Explain the difference between Point Sources of groundwater pollution and Nonpoint Sources of groundwater pollution. Why could a storm sewer be considered either?
8. An underground water supply in an urban city area is more likely to be contaminated by Point Source contamination or Nonpoint Source contamination?
9. Since storm sewers lead to water treatment plants, any hazardous chemicals that are washed into the sewers by rain will be safely treated before re-entering the groundwater system.
☐ True ☐ False
10. All contamination of underground water originates with people.
☐ True ☐ False

HOW HOUSEHOLD HAZARDOUS MATERIALS CONTAMINATE GROUNDWATER

1. Why is Iowa more reliant on groundwater as a source for drinking water than almost all other states?

Because surface water sources are limited in Iowa. Relatively, we don't have a lot of lakes.

2. Why might Hawaii and Florida be even more dependent on groundwater than Iowa?

Because while surrounded by water, that water is ocean water and too saline to be used for drinking water.

3. In general, will HHMs affect groundwater or surface water first? Why?

Surface water. Because most HHM contamination is caused when rain washes the chemicals into rivers, lakes, ponds, etc.

4. An Aquifer is:

- a. a giant underground hollow area filled with water.
- b. an underground saltwater ocean.
- ☒ c. places underground where water has saturated the rock or gravel.
- d. a large surface lake.

5. Pollution can't reach the underground aquifers.

☐ True ☒ False

6. Buried Channel aquifers generally have the best-quality water because they're more protected from man-made contamination.

☒ True ☐ False

7. Explain the difference between Point Sources of groundwater pollution and Nonpoint Sources of groundwater pollution. Why could a storm sewer be considered either?

Point sources are large sources that originate from a single identifiable location, including a landfill, a farm feed lot, or a factory. Nonpoint sources don't come from a single identifiable source. Rather, they accumulate from many different sources (chemicals flushed down the drains at different houses in different neighborhoods or farm fields, or poured onto the ground in different areas). A storm sewer system could be defined either way because it collects water from many different sources, but it drains the outflow at a single point.

HOW HOUSEHOLD HAZARDOUS MATERIALS CONTAMINATE GROUNDWATER

8. An underground water supply in an urban city area is more likely to be contaminated by Point Source contamination or Nonpoint Source contamination?

Nonpoint Source, because there is a higher concentration of people to serve as contamination sources.

9. Since storm sewers lead to water treatment plants, any hazardous chemicals that are washed into the sewers by rain will be safely treated before re-entering the groundwater system.

☐ True ☒ False

Most storm sewers empty directly into the surface water system (rivers, lakes, and streams) and do not go to a water treatment plant. Besides, a water treatment plant may not be able to filter out a particular hazardous chemical.

10. All contamination of underground water originates with people.

☐ True ☒ False

Contamination can also occur from natural sources, including salt and minerals.

H. Other IDNR Resources

Your nearest office of the Iowa Department of Natural Resources may have models of aquifers and the water system available for loan and demonstration to classrooms. Please contact the IDNR for more information on how they can help. Also, check with the Soil and Water Conservation District office and the County Conservation Board.

IV. Classroom Session #3 – Proper Handling & Disposal of Household Hazardous Material

A. General Rules

1. Keep HHM containers dry and away from extreme heat and cold.
2. Keep where children and pets cannot reach them.
3. Keep in original or labeled containers.
4. Store in upright positions.
5. Don't mix chemicals together.
6. Buy only what you need, and use what you buy.
7. What you can't use, try to give to someone who can.

Note: It is unlawful to give a container of pesticide to someone else if it has been opened or if its label is missing or cannot be easily read).

8. NEVER pour waste fluids into storm drains, sewers, on the ground, septic systems or in the garbage.

B. IDNR Waste Management Assistance

1. Central Office – Mission Statement: “To educate and assist Iowans to protect, conserve and enhance natural resources and the environment for all generations through the sustainable practices of pollution prevention and responsible waste management.”
2. Regional Collection Centers – These are permanent, year-round sites for collection of household hazardous materials now serving many Iowa counties. All operate with funding and technical assistance from the Waste Management Assistance staff. The department's goal is to have a regional collection center available for each Iowa county.

(See IDNR Web site for locations and contact information:

www.safesmartolutions.org)

C. Paints and Solvents

1. Paint – About one out of three consumers said they have unwanted leftover paint stored in their homes. Paint makes up about half of all the HHM collected by local collection centers (although most is technically not a HHM). *(source: The National Paint & Coatings Association)*
 - a. Oil-based: Call Your Regional Collection Center
 - b. Latex (water-based). While chemicals inside most latex paint are toxic and hazardous if swallowed, latex paint is not considered a Household Hazardous Material. There is, however, a proper way to dispose of it:
 - i. Don't pour down drain
 - ii. If DRY, can be safely put in trash
 - iii. If it's not already dry, leave lid off can. If there's too much left to dry without help, spread paint in a newspaper-lined cardboard box and let it dry a layer at a time. Then dispose of newspapers in the regular trash.

2. Solvents – While solvents like paint thinners, turpentine, and furniture strippers are toxic and flammable, they can be used in a way that's safe:
 - a. Allow the solid contaminants in the used solvents to settle to the bottom of the container.
 - b. Pour the liquid through a fine cloth to strain the solids.
 - c. Allow the solids to dry and discard in the trash.
 - d. Reuse the solvent.
 - e. Store solvents out of the reach of children in a clearly labeled container.

D. Cleaners

1. Drain Openers/Kitchen-Bathroom Cleaners/Bleach (Corrosive/Toxic)
 - a. Best option: Use as directed.
 - b. Second best: Give away to someone to use as directed.
 - c. To discard: Some cleansers can be poured down a drain if you use lots of water to do it.). If cleansers are designed to be used with water in a home or in sinks, showers, toilet bowls, and tubs, the material is probably drain disposable. Let the water run, rinse the container and slowly pour the water/chemical down the drain. Allow the water to continue running after the chemical is gone.
Allow the container to air dry (or swab with paper towels), wrap in newspaper and dispose in household refuse.
 - d. *If you have a septic tank*, you shouldn't put chemicals down the drain. They can kill the special bacteria that is needed for septic systems to work.
2. Furniture Polish; spot removers (Flammable)
 - a. Use.
 - b. Give away.
 - c. Call Regional Collection Center.

E. Exercises

1. Math Exercise (*for older grades only*)

Objective – Teach how to effectively calculate appropriate quantity of paint to buy, demonstrating that the best step to eliminate wasted paint is to buy the correct amount in the first place.

Materials – Pencil, paper, calculator.

Procedure - Divide class into groups. Figure out how many gallons of paint are needed to cover the walls of an 18 x 30 foot room with 8-foot ceilings if one gallon covers 300 square feet of wall. There are four windows, each measuring 2 x 4 feet, and one doorway 3 feet wide and 7 feet high. The salesman recommends that you apply two coats.

Approximately how much paint will be left over from the last can? What should you do with what's left over? Did all groups come up with the same answer?

Solution: The wall surface would measure 715 square feet. At 300 square feet per gallon, each coat would require 2.384 gallons, or 4.767 gallons for two coats, leaving .232 gallons in the last can (or about a quarter of a gallon). The leftover paint should be stored for future touchups, or given to someone else who can use it.

2. The Dilution Solution (*source: EPA*)

Objective – To show that dilution is not a good solution to surface water pollution.

Materials – 1 empty aquarium or other large clear container; two 500-ml beakers or glass jars; tap water; red food color.

Background – The water in surface water bodies, such as lakes and oceans, is replenished over time by being fed through rivers, rainfall, etc. The amount of time it takes for a body of water to completely change is called the “retention time” (also “renewal time” and “flush rate”). The amount of time varies with the body of water. Lake Erie has a retention time of nine years. For Lake Superior, it’s 200 years. However, that doesn’t mean that all existing pollution is washed away in that same amount of time.

Procedure – Fill a beaker or jar with tap water and stir in a few drops of food color, turning the water bright red. The red represents a pollutant in a medium-sized Midwestern lake. Ask students how long they think the retention time would be for the lake. Try one complete renewal of the water by filling the second beaker with clear tap water. With a student holding the “lake” with red water over an aquarium, pour this new water into the “lake.” The water will mix and overflow into the aquarium. Observe that while all the water has been “replaced,” the pollutant is still visible.

Repeat several times until the “lake” water is again clear, and multiply the number of times it took by the 3-to-10 years retention time for a medium-sized lake in the Midwest. The result is how long it would take for all the pollutants to clear from the hypothetical lake (assuming no more pollutants are introduced). Don’t forget the water in the aquarium. Note that it’s red — the pollution didn’t disappear; it merely moved to another water source!

HHM SESSION THREE QUIZ

Name: _____

PROPER HANDLING AND DISPOSAL OF HHM, PART 1

1. List 5 rules for properly storing Household Hazardous Materials:

2. What is an “RCC” and what does it do?

3. What’s the name and location of your nearest RCC?

4. The single most common item collected by government hazardous material handling programs is _____.

5. From an environmental standpoint, the best commonly-found paint to use is _____ paint.

6. Paint thinner is highly toxic and flammable, and definitely a Household Hazardous Material. Rather than disposing of it, it can be reused. How?

7. The best way to dispose of highly flammable products like spot removers, rust removers, and furniture strippers is to use them as directed. Otherwise, it’s best to:

- a. flush down the drain.
- b. call your RCC.
- c. let dry and put in the garbage.
- d. pour on ground.

8. What state agency is responsible for protecting the quality of Iowa’s water sources?

9. Name the different factors that go into deciding how much paint to buy.

10. The state tells us we should be careful not to let Household Hazardous Materials end up in “the wrong package.” What does that mean?

HHM SESSION THREE QUIZ

[INSTRUCTOR VERSION]

PROPER HANDLING AND DISPOSAL OF HHM, PART 1

1. List 5 rules for properly storing Household Hazardous Materials:

Keep HHM containers dry and away from extreme heat and cold.

Keep where children and pets cannot reach them.

Keep in original or labeled containers.

Store in upright positions.

Don't mix chemicals together.

Buy only what you need, and use what you buy.

2. What is an “RCC” and what does it do?

An RCC — Regional Collection Center — is independently owned and operated under state supervision. It is responsible for the collection and proper disposal of Hazardous Materials. The Iowa DNR's goal is to eventually have each county served by an RCC.

3. What's the name and location of your nearest RCC?

Consult www.safesmartolutions.org for a complete list.

4. The single most common item collected by government hazardous material handling programs is paint.

5. From an environmental standpoint, the best commonly-found paint to use is latex paint.

6. Paint thinner is highly toxic and flammable, and definitely a Household Hazardous Chemical. Rather than disposing of it, it can be reused. How?

Store in closed jar until particles settle. Strain off clear liquid that remains and reuse. Dry remaining sludge, wrap in plastic, and discard in trash.

7. The best way to dispose of highly flammable products like spot removers, rust removers, and furniture strippers is to use them as directed. Otherwise, it's best to:

- a. flush down the drain.
- ☒ b. call your RCC.
- c. let dry and put in the garbage.
- d. pour on ground.

8. What state agency is responsible for protecting the quality of Iowa's water sources?

Iowa Department of Natural Resources

9. Name the different factors that go into deciding how much paint to buy.

How many coats are needed; height and length of the walls; size of windows, doors, and other non-wall spaces; how much wall area a gallon of that type of paint covers.

10. The state tells us we should be careful not to let Household Hazardous Materials end up in “the wrong package.” What does that mean?

The “wrong package” is us — the people of Iowa. Those dangerous chemicals you read on package labels could end up in us if not properly disposed of.

V. Classroom Session #4 –Handling & Disposal of Household Hazardous Materials, Part 2

A. Automotive/Engine Products

1. Used Motor Oil

- a. 5% of do-it-yourselfers dump old oil on ground; another 3% put in trash

(From a survey of 220 Iowa households conducted in 2000).

- b. Used oil contains toxins, including lead, naphthalene, & chlorinated hydrocarbons.
- c. Store in clean plastic jug (it's important not to mix it with other chemicals)
- d. Take to authorized retailer for recycling.
- e. What happens to recycled oil? (*American Petroleum Institute*)
 - i. Transporters collect it in tanker trucks by vacuuming it from the storage containers. It's then tested for hazardous components before being mixed in a holding tank, and eventually it's delivered to re-refiners, processors, or sites that burn the oil for fuel.
 - ii. Reprocessing is the most common method of recycling used motor oil in the US (75% of all recycled oil). Of that (all numbers are national figures):
 - 43% goes to asphalt plants
 - 14% to industrial boilers (factories)
 - 12% to utilities for power generation;
 - 12% to steel mills
 - 5% to cement/lime kilns
 - 5% is blended to make marine fuels
 - 4% to pulp & paper mills
 - >1% to commercial boilers (to heat schools, offices, etc.)
 - 5% to others.

- iii. 14% of recycled oil is turned over to re-refiners who clean and treat it to return it to its original virgin oil state (motor oil does not wear out; it just gets dirty).
 - iv. 11% of used motor oil is used in specially designed space heaters in automotive bays and municipal garages (not recommended for home use). The estimated 75,000 heaters use about 113 million gallons of used oil per year, saving heating costs.
- 2. Antifreeze – Ethylene Glycol (Poisonous)
 - a. Contact IDNR or RCC for recycling information.
 - 3. Gasoline (Poisonous/Flammable/Explosive)
 - a. If stored for a long time, use a stabilizing additive
 - b. If gas is unusable, call your Regional Collection Center or the IDNR.
 - 4. Car Batteries (Corrosive)
 - a. Retailers accept old batteries for recycling when a new one is purchased.
 - b. If not buying a new battery, call IDNR for a list of collection sites or contact a retailer. Many will collect batteries even without purchase.
 - 5. Car Wax/Detergents (Poisonous)
 - a. Best to wash car at commercial car wash (which redirects it to a waste water treatment plant).
 - b. Don't wash in driveway or street where detergent reaches storm sewer.
 - c. Instead, wash over gravel or grass to naturally filter some contaminants.
 - 6. Other Fluids (windshield wiper fluid; brake fluid; transmission fluid).
Contact your Regional Collection Center or the IDNR for disposal.

B. Pesticides/Herbicides/Fertilizers

1. Weed killer; insecticides; flea-roach powder; rat/mouse poison; mothballs (Poisonous); flea collars
 - a. Don't pour onto ground, bury, dump in sewer, or flush.
 - b. Don't use pesticides when rain is forecast (rain will wash directly into water system).
 - c. Don't use pesticides when rain is forecast (rain will wash directly into water system).
 - d. Only use as intended and directed. Note: It is unlawful to give a container of pesticide to someone else if it has been opened or if its label is missing or cannot be easily read.
 - e. Empty plastic liquid containers should be rinsed out 3 times and recycled. Pesticide rinse water can be reused as more pesticide.
 - f. Solids and spray cans – mothballs, flea collars, insecticide cans – should be used as directed or handled by Regional Collection Center.
2. Wood preservatives (Poisonous/Flammable). Contact your Regional Collection Center or the IDNR.

C. Exercises

1. *Home Survey* - Millions of gallons of used motor oil is drained from car engines across Iowa each year, much of it by do-it-yourselfers. Survey students to see if they know whether their parents have a mechanic change their cars' oil or whether their dad or mom do it. What about oil filters, which are changed when the oil is changed? They contain oil even after being properly drained.
2. *Recycling Center Survey* – Contact the IDNR for used oil and used oil filter collection sites. Have students visit different automotive service centers (include a representative range, from small service stations to large car dealerships) to see how many recycle oil, and investigate how it's collected and saved. Be sure to call ahead for appointment. Ask about procedures, regulations, how the state enforces the rules, and how things overall have changed in the past 20 years.
3. *Classroom Discussion* - Compare results found within different families and oil collection sites. Talk about the economic implications of not recycling used motor oil (recycling 23 million gallons of used motor oil would save about half a million barrels of crude oil a year).

HHM SESSION FOUR QUIZ

Name: _____

PROPER HANDLING AND DISPOSAL OF HHM, PART 2

1. According to an Iowa DNR study, about what percentage of people who change the oil in their own car dispose of it improperly?
2. Who collects used motor oil from do-it-yourself oil changes? What do they do with it?
3. The largest user of recycled motor oil is _____.
4. More than 113 million gallons of used motor oil is burned in special space heaters in automotive bays and municipal garages. What percentage is this of all oil turned in for recycling?
5. What car part (not a fluid) that's considered a Household Hazardous Material is commonly recycled?
6. From an environmental perspective, what's the best place to wash a car? Why?
7. Why is it a bad idea to wash a car in your driveway?
8. It's illegal to change your own car oil.
☐ True ☐ False
9. Is it better to fertilize a lawn or apply pest and/or weedkiller when the forecast is for sunshine, or when rain is expected? Why?
10. List three environmental responsibilities that car owners have:

PROPER HANDLING AND DISPOSAL OF HHM, PART 2

1. According to an Iowa DNR study, about what percentage of people who change the oil in their own car dispose of it improperly?
At least 8%.
2. Who collects used motor oil from do-it-yourself oil changes? What do they do with it?
It's collected by most service stations and car dealerships with service departments. They store it until it can be collected and transported to reprocessing facilities.
3. The largest user of recycled motor oil is asphalt plants.
4. More than 113 million gallons of used motor oil is burned in special space heaters in automotive bays and municipal garages. What percentage is this of all oil turned in for recycling?
11%.
5. What car part (not a fluid) that's considered a Household Hazardous Material is commonly recycled?
Battery
6. From an environmental perspective, what's the best place to wash a car? Why?
Commercial car washes. Because the water is directed to the waste water treatment plant.
7. Why is it a bad idea to wash a car in your driveway?
The detergents are washed down the driveway into the street, where they enter the storm sewer system, which probably drains right into the natural water system.
8. It's illegal to change your own car oil.
☐ True ☒ False
It's just illegal to improperly dispose of the used oil.
9. Is it better to fertilize a lawn or apply pest and/or weedkiller when the forecast is for sunshine, or when rain is expected? Why?
When the forecast is clear. Rain will wash the fertilizer into the water system before it can be absorbed.
10. List three environmental responsibilities that car owners have:
Properly dispose of used motor oil, antifreeze, and other fluids; fix oil leaks, recycle batteries; keep car tuned and tires inflated to improve gas mileage; wash the car responsibly; properly dispose of products like car detergents & waxes.

VI. Classroom Session #5 – Alternatives to Household Hazardous Materials

A. Buy Smart

1. Only Buy What You Need
2. Buy Better Products
 - a. For example, buy latex instead of oil-based paint
 - i. It's disposable (when dry).
 - ii. Water — not turpentine or thinner — are all that's needed for cleanup (avoiding the creation of another HHM disposal problem).
 - b. And use traps rather than poison for mice and other pests (makes little difference to the mouse).

B. Safer Choices

1. Instead of **toilet cleaner**, use brush and baking soda or mild detergent; or a paste of borax and lemon juice.
2. Instead of **bathroom cleaners**, try a baking soda and water mixture.
3. Instead of **floor/furniture polish**, mix 1 part lemon juice with 2 parts olive or vegetable oil.
4. Instead of **carpet cleaner**, try just sprinkling baking soda on carpet.
5. Instead of **garden bug spray**, try mixing 1 part crushed hot peppers with 4 parts water. Strain and spray on plants (be careful to avoid eyes).
6. For **ants**, sprinkle cream of tartar, red chili powder, or dried peppermint where they enter.
7. For **roaches and silverfish**, use equal parts baking soda and powdered sugar.
8. Instead of **vinyl floor cleaner**, use 1/2 cup vinegar in 1 gallon of water.
9. Instead of **air freshener**, use open box of baking soda in refrigerators, closets, & bathrooms.
10. Instead of **brass polish**, use Worcestershire sauce.

C. Exercise

Baking Soda as a safe alternative

Objective – To demonstrate how common baking soda can be an effective odor-killer, and is much safer than room “air fresheners.” While air fresheners are not particularly a hazard to water, they are classified a Household Hazardous Material in the home because of their toxicity.

Materials – Several clean small wide-mouth jars with lids (such as baby food jars), liquid odor sources (possibilities include vinegar, lemon juice, pickle juice, vanilla extract, sauerkraut juice, and water from canned tuna), cotton balls, one box of baking soda.

Procedure – Divide class into small groups and give each two or three jars. In each jar, put a cotton ball, followed by two to three drops of an odor source. Have students close the jar and shake it several times, then let it sit for at least 2 minutes. Open jars and have students smell the odor and describe it. Then place a teaspoon of baking soda into each jar along with the cotton ball. Close jar again and shake several times, again letting it sit for 2 minutes, but with the lid loosely on (allowing gas to escape and preventing pressure build-up). Open the jar and compare the odor to the original.

Since many odors are caused by acids, and baking soda neutralizes acids through chemical reaction (releasing carbon dioxide in the process), new substances are formed that have different or less obvious odors. Some odors are not caused by acids; they will not be as affected by the baking soda. Students can also be asked to measure relative pH balance of the odor source liquids with litmus or indicator paper.

HHM SESSION FIVE QUIZ

Name: _____

ALTERNATIVES TO HOUSEHOLD HAZARDOUS MATERIALS

1. When you're done eating your steak, you can use the leftover Worcestershire sauce to _____.
2. Roaches and silverfish are in for a nasty surprise when you mix baking soda with _____.
3. Instead of "scrubbing bubbles," you can clean your bathroom fixtures with a paste made of _____ and water.
4. You can also clean your toilet with a paste made of _____ and some fruity _____.
5. No need for that can of floor or furniture polish that uses a petroleum oil base. Instead, try mixing one part _____ juice with two parts _____ or _____ oil.
6. If you love your carpet when it smells fresh, just sprinkle a little _____ on it and vacuum.
7. Why use nasty chemicals on your vinyl floor when you can just mix half a cup of _____ with a gallon of water?
8. You'll bring tears to the eyes of wandering ants by sprinkling a little _____ powder at the point where they are coming into your home.
9. Sometimes the air gets not-very-fresh in your home. Instead of using an air freshener that works by deadening the nerves in your nose, try opening a box of _____.
10. To keep bugs off your garden plants, instead of using poison try a spray of 1 part crushed _____ with 4 parts _____. Or you can introduce your garden to beneficial _____.

HHM SESSION FIVE QUIZ

[INSTRUCTOR VERSION]

ALTERNATIVES TO HOUSEHOLD HAZARDOUS MATERIALS

1. When you're done eating your steak, you can use the leftover Worcestershire sauce to polish brass.
2. Roaches and silverfish are in for a nasty surprise when you mix baking soda with powdered sugar.
3. Instead of "scrubbing bubbles," you can clean your bathroom fixtures with a paste made of baking soda and water.
4. You can also clean your toilet with a paste made of borax and some fruity lemon juice.
5. No need for that can of floor or furniture polish that uses a petroleum oil base. Instead, try mixing one part lemon juice with two parts olive or vegetable oil.
6. If you love your carpet when it smells fresh, just sprinkle a little baking soda on it and vacuum.
7. Why use nasty chemicals on your vinyl floor when you can just mix half a cup of vinegar with a gallon of water?
8. You'll bring tears to the eyes of wandering ants by sprinkling a little red chili powder at the point where they are coming into your home.
9. Sometimes the air gets not-very-fresh in your home. Instead of using an air freshener that works by deadening the nerves in your nose, try opening a box of baking soda.
10. To keep bugs off your garden plants, instead of using poison try a spray of 1 part crushed hot peppers with 4 parts water. Or you can introduce your garden to beneficial bugs (such as lady bugs or praying mantes).

VII. Project Summary

A. Review

1. What makes some household materials hazardous?
2. How can you identify Household Hazardous Materials?
3. What are some general rules about buying, storing, and disposing of HHM?

B. Discuss:

1. The IDNR Slogan: Safe, Smart, Solutions for Iowa
2. What does the IDNR mean when it says we shouldn't let HHM get into "The Wrong Package"?

C. Iowa DNR Web site review

D. How students can continue to help

1. Exhibit care in using and disposing of HHMs
2. Make safe buying decisions
3. Educate others

E. Exercises

1. Break class into small groups to discuss and outline plans society should use to approach the problem of Household Hazardous Materials. Are there laws that can be created? How would they be enforced? What kinds of public relations campaigns would reach the appropriate audience? What would be an effective message? Have each group prepare a presentation of a public relations/advertising message that would convince consumers to more carefully handle and dispose of hazardous household materials.
2. Have students identify these terms (either in writing as quiz or in class discussion):
 - a. Leachate (seepage from garbage landfills into the ground below)
 - b. Toxic (poisonous; substance that causes illness, injury, or death)
 - c. Aquifer (underground geological formation in which rocks, gravel, or sand is filled with water)
 - d. Groundwater (the water that flows through aquifers)
 - e. Nonpoint Source Pollution (contamination that originates from a variety of widespread sources).
 - f. Point Source Pollution
 - g. RCC (Regional Collection Center)
 - h. HHM (Household Hazardous Material)
 - i. Caustic (erodes metal or skin)

HHM SESSION **REVIEW** QUIZ

Name: _____

WRITE DEFINITIONS FOR THESE TERMS.

1. Leachate

2. Toxic

3. Caustic

4. Aquifer

5. Groundwater

6. Nonpoint Source Pollution

7. Point Source Pollution

8. RCC

9. HHM

HHM SESSION REVIEW QUIZ

[INSTRUCTOR VERSION]

Name: _____

WRITE DEFINITIONS FOR THESE TERMS.

1. Leachate - *seepage from garbage landfills into the ground below*
2. Toxic - *poisonous; substance that causes illness, injury, or death*
3. Caustic - *erodes metal or skin*
4. Aquifer - *underground geological formation in which rocks, gravel, or sand is filled with water*
5. Groundwater - *the water that flows through aquifers*
6. Nonpoint Source Pollution - *contamination that originates from a variety of widespread sources*
7. Point Source Pollution – *contamination that originates from an unidentifiable point or pipe*
8. RCC - *Regional Collection Center; a facility for collecting and disposing of hazardous materials*
9. HHM - *Household Hazardous Material*



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SOLUTIONS FOR IOWA**

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